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Passive smoking in cystic fibrosis

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The families of 32 children with cystic fibrosis (CF) were interviewed about both their tobacco consumption and their childrens physical activities. Hospital records informed about treatment frequency, lung function and clinical score. Cystic fibrosis families smoked far more than the Swedish average and the passive smokers among our patients seemed to fare less well in all parameters. The children of smoking mothers required significantly longer periods of intravenous antibiotic treatment ($P > 0.05$). Frequent physical exercise seemed to compensate for the potential harmful effects of passive smoking and children with high physical activity living in families who smoked needed significantly less frequent antibiotic treatment than the inactive children ($P > 0.02$). Although this series is small, the results indicate that a smoke-free environment may be important for CF patients. General information is insufficient and extensive psychological support to the families is probably necessary.

Introduction

The hazards of indoor environmental factors are widely recognized. In recent years, investigators have found not only an increased rate of respiratory symptoms and infections in normal children exposed to tobacco smoke (1,2) but also an effect on the children's lung function (3,4). By measuring saliva cotinine levels, parental smoking has been calculated to equal active smoking of at least 80 cigarettes a year (5). Cystic fibrosis (CF) is a chronic hereditary disease that from early infancy drastically increases the risk of serious respiratory infections. A rapid colonization by bacteria, commonly *Staphylococcus aureus* and/or *Pseudomonas aeruginosa* is observed and the airway secretion is abnormally thick and tenacious. Thus, it seems that CF children would be more at risk than others of being affected by passive smoking. Consequently, the following questions were asked: 'Do CF children daily exposed to tobacco smoke in their homes have more frequent airway infections?' 'Do they perform less well in lung function tests or do they have a poorer general state of health than CF children not exposed to tobacco smoke?'

Patients and Methods

This study was approved by the Ethics Committee at Karolinska Institutet.

Thirty-two of 64 CF patients regularly attending the departments of Pediatrics and Lung Medicine at Huddinge Hospital were excluded from the study since, for example, they no longer lived with their families or lived too far away to be interviewed. The families of 32 CF children aged 1–20 years (mean 10·5, median 12 years) were visited and interviewed by C.S. The interviews were based on a standard questionnaire. Hospital records provided data about antibiotic treatment, lung function tests and the general state of health expressed by the Shwachman score (6). A clinical score of ≥ 71 points was considered good to excellent and a score of less than 71 points mild to serious. We regarded a consumption of 1 cigarette/day or more at home as a smoking family. The patterns of colonization was similar in both groups, as was age and the use of oral antibiotics (penicillinase-stable penicillins and ampicillins). The number of days of antibiotic treatment in hospital during one year was used to measure respiratory infection. This variable was dicotomized into one group with high risk, i.e. ≥ 31 days in hospital with intravenous antibiotics, and one group with low risk, < 31 days in hospital. The lung function was assessed by FEV_1 and a rating of $\geq 70\%$ of predicted value was regarded as good while a rating of $< 70\%$ was considered poor. Physical activity was defined as regular activity on scheduled days each week. Those who were considered highly active had four or more activities during the week and the less active 0–3.

Statistical analysis was made with Chi-square with Yate's correction of Fisher's exact test.

Results

SMOKING HABITS

Twenty-two of the 32 families smoked: in five families both parents smoked; in five families it was

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Table 1 Relation between the clinical score of the CF patients and smoking in the families

Clinical score	Nonsmokers	Smokers	Total
≥71	9 (90%)	16 (73%)	25 (78%)
<71	1 (10%)	6 (27%)	7 (22%)
Total	10 (31%)	22 (69%)	32 (100%)

Table 2 Intravenous antibiotic treatment in CF patients exposed and not exposed to tobacco smoke in their homes

Days of i.v. treatment	Nonsmokers	Smokers	Total
≥31	1 (10%)	7 (32%)	8 (25%)
<31	9 (90%)	15 (68%)	24 (75%)
Total	10 (31%)	22 (69%)	32 (100%)

only the father who smoked and, in eight families only the mother. In three families the mother and one sibling smoked and in one family only siblings. In families where smoking was confined to one room or otherwise restricted in consideration of the child, much fewer cigarettes were smoked than in families where no limits were set. The smoking habits had not changed over time.

PASSIVE SMOKING AND CLINICAL SCORE

Smoking at home appeared to be associated with a poorer health status of the CF child. As shown in Table 1, six out of seven children with a clinical score <71 lived in smoking families. However, this difference was not statistically significant.

SMOKING AND AIRWAY INFECTIONS

Parental smoking seemed to correlate with an increased tendency for airway infections in CF children (Table 2). The most reliable records of airway infection were judged to be the number of days of *i.v.* antibiotic treatment in hospital. Seven out of eight patients requiring ≥31 days of treatment lived in smoking families and only one in a nonsmoking family. Also in the group of patients demanding less treatment, the exposed children dominated by 15 to 9. In the few families where only one parent smoked, maternal smoking appeared to be more harmful to the patient (Table 3). There was a statistically significant difference between days of treatment if the mother smoked compared to if only the father smoked ($P < 0.05$).

Table 3 Intravenous antibiotic treatment in CF patients exposed and not exposed to tobacco smoke in families with only one parent smoking

Days of i.v. treatment	Mothers		Fathers	
	Nonsmokers	Smokers	Nonsmokers	Smokers
≥31	1 (10%)	3 (38%)*	1 (10%)	1 (20%)
<31	9 (90%)	5 (62%)	9 (90%)	4 (80%)
Total	10	8	10	5

*$P < 0.05$ compared to families where only the father smoked.

Table 4 Intravenous antibiotic treatment in CF patients with low and high physical activity in nonsmoking and smoking families

Days of i.v. treatment	Low activity		High activity	
	Nonsmokers	Smokers	Nonsmokers	Smokers
≥31	0 (0%)	5 (45%)*	1 (25%)	2 (18%)
<31	6 (100%)	6 (55%)	3 (75%)	9 (82%)
Total	6	11	4	11

*$P < 0.02$ compared to patients with high activity living in smoking families.

Table 5 Distribution of FEV_1 values (% of predicted) in CF patients exposed and not exposed to tobacco smoke. Seven of the youngest children could not be assessed and were therefore excluded

FEV_1 (%)	Nonsmokers	Smokers	Total
≥70	5 (71%)	10 (56%)	15 (60%)
<70	2 (29%)	8 (44%)	10 (40%)
Total	7 (28%)	18 (72%)	25 (100%)

THE BENEFIT OF PHYSICAL ACTIVITY

For patients with high physical activity, passive smoking seemed to matter less (Table 4). The active children had fewer days of hospital treatment than the less active, who required significantly more treatment in hospital if the parents smoked ($P < 0.02$).

PASSIVE SMOKING AND LUNG FUNCTION

The lung function of 25 patients was not correlated to passive smoking (Table 5). Seven of the smallest children had to be excluded as they could not perform a reliable spirometry.

Discussion

Persons interviewed about their tobacco habits often tend to underestimate their consumption. This is particularly true in situations burdened with guilt like the one investigated here. However, we did not want to increase the burden and therefore only one family member was interviewed and questions about smoking duration and earlier habits also had to be omitted. On the other hand, a high degree of uniformity was achieved by using only one interviewer (C.S.). Despite the small number of patients, the observed trends were evident. Similar effects have been seen in asthmatic children (7). The more pronounced effect of maternal smoking has also been observed earlier (8). It was surprising that so many CF parents smoked; the prevalence of smokers in CF families exceeded the Swedish average by approximately 30% (69% and less than 40%, respectively) (9). The direct acute effects manifested as cough in a smoking environment hardly escapes notice. In addition the doctor had advised against smoking on several occasions. Therefore, profound psychological factors seem to govern the smoking habits. In some smokers the fear of developing lung cancer creates so much anxiety that they smoke even more (9). It is possible that CF parents, by a similar mechanism, may increase their tobacco consumption.

The suggested beneficial effect of physical activity in this study is probably due to activity itself (10), and not to a mere absence from home. It can be argued that the most severely ill patients simply were incapable of being active, but no patient in this series was disabled to that degree and there was no statistical difference in clinical status or pulmonary function between children from smoking and nonsmoking families. This study therefore suggests, that passive smoking increases the need for intensive antibiotic treatment in patients with CF and therefore is detrimental to their health, especially in combination with low physical activity.

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